



US Army Corps
of Engineers



Lower Missouri River Jefferson City L-142 Flood Risk Management Feasibility Study

Final Feasibility Report and Integrated Environmental Assessment

Appendix A5 Underseepage Analysis

July 2026



MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

CA 13 - Selected Plan

Boring		Depth	Bottom Elevation
13+00 to 110+00 (Trky Crk tieback)			
ADU58	554.0	15.8	538.2
AD2	550.0	8.3	541.7
AUD26	553.0	8.7	544.3
ADU59	551.3	7.0	544.3
AUDC12	554.0	15.0	539.0
AD4	547.8	8.8	539.0
AUD13	553.0	10.2	542.8
AD-5	548.0	35.0	513.0
AUD28	552.0	10.0	542.0
AD6	545.0	12.4	532.6
ADU60	554.0	21.1	532.9
AUD14	549.0	15.0	534.0
Average	551.1	13.8	537.3

Top of Levee at Elev 561
Levee Check at max ht (stat. 103+00)
Levee ht assumed = 16'
R.S.Ground, Civil x-section Stat.103+00
L.S. Ground at AD-6, civil x-section 103+00
Assumed Blanket Thickness Assumed=12'

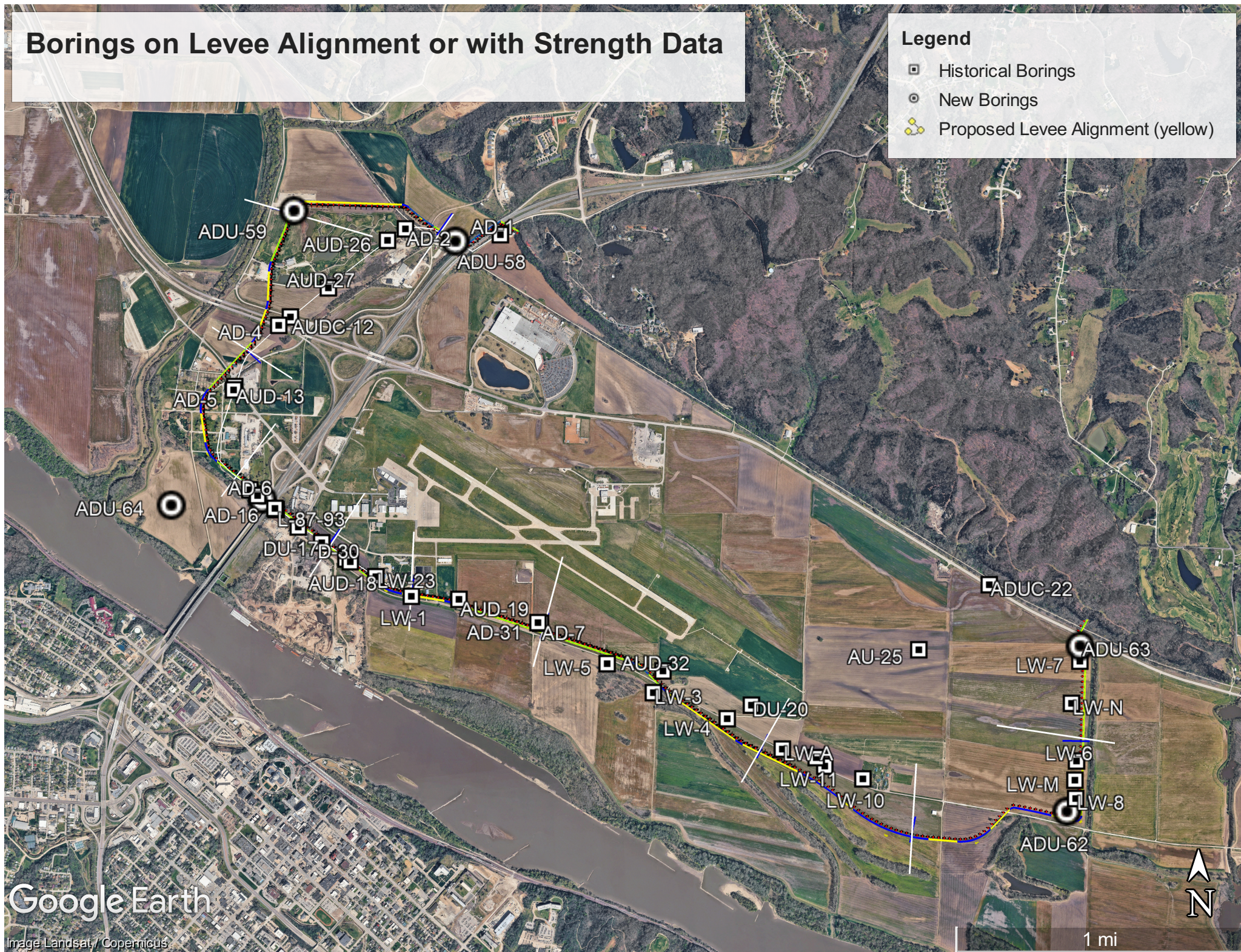
112+00 to 278+00 (Mainstem)				Assumed Levee Thickness (mainstem) = 10'
L-87-93	546.1	9.0	537.1	<u>stat. 112+00 to 135+00 of Mainstem</u>
AD16	552.0	5.0	547.0	top of levee= elev.561 (Civil X-section 124+00)
DU17	555.0	7.0	548.0	RS Ground Elev.=545 Civil X-section 124+00)
LW14	546.0	21.0	525.0	LS Ground Elev = 543 (Civil X-section 124+00)
D30	544.0	8.8	535.2	<u>stat. 135+00 to 146+00 of Mainstem</u>
AUD18	549.0	10.0	539.0	top of levee= elev.560 (Civil X-section 142+00)
LW1	549.2	25.0	524.2	RS Ground Elev.=548 (Civil X-section 142+00)
AUD19	553.0	19.0	534.0	LS Ground Elev = 548 (Civil X-section 142+00)
AD31	544.0	8.7	535.3	<u>stat. 146+00 to 183+00 of Mainstem</u>
AD7	540.2	6.2	534.0	top of levee= elev.560 (Civil X-section 167+00)
LW5	547.0	9.0	538.0	RS Ground Elev.=545 (Civil X-section 167+00)
LW3	542.0	11.0	531.0	LS Ground Elev = 545 (Civil X-section 167+00)
AUD32	546.0	12.0	534.0	<u>stat. 183+00 to 225+00 of Mainstem</u>
DU20	554.0	7.0	547.0	top of levee= elev.559 (Civil X-section 213+00)
LW11	548.0	16.5	531.5	RS Ground Elev.=541 (Civil X-section 213+00)
LW4	546.7	9.0	537.7	LS Ground Elev = 544 (Civil X-section 213+00)
LW10	548.0	19.0	529.0	<u>stat. 225+00 to 278+00 of Mainstem</u>
				top of levee= elev.558 (Civil X-section 245+00)
Average		12.0	535.6	RS Ground Elev.=545 (Civil X-section 245+00)
				LS Ground Elev = 545(Civil X-section 245+00)

278+00 to 316+00 (drainage ditch)				Assumed Levee Thickness (drainage ditch) =15'
ADU62	547.0	10.4	536.6	<u>stat. 278+00 to 316+00 of DD tieback</u>
LW7	547.3	19.5	527.8	top of levee= elev.558 (Civil X-section 293+00)
LWN	541.6	12.5	529.1	RS Ground Elev.=539.3 (Civil X-section 293+00)
LW6	547.2	21.5	525.7	LS Ground Elev = 541.1 (Civil X-section 293+00)
LWM	544.4	7.5	536.9	
LW8	547.1	18.0	529.1	
Average	545.8	14.9	530.9	

Borings on Levee Alignment or with Strength Data

Legend

- Historical Borings
- New Borings
- Proposed Levee Alignment (yellow)



Google Earth

Image Landsat / Copernicus

1 mi

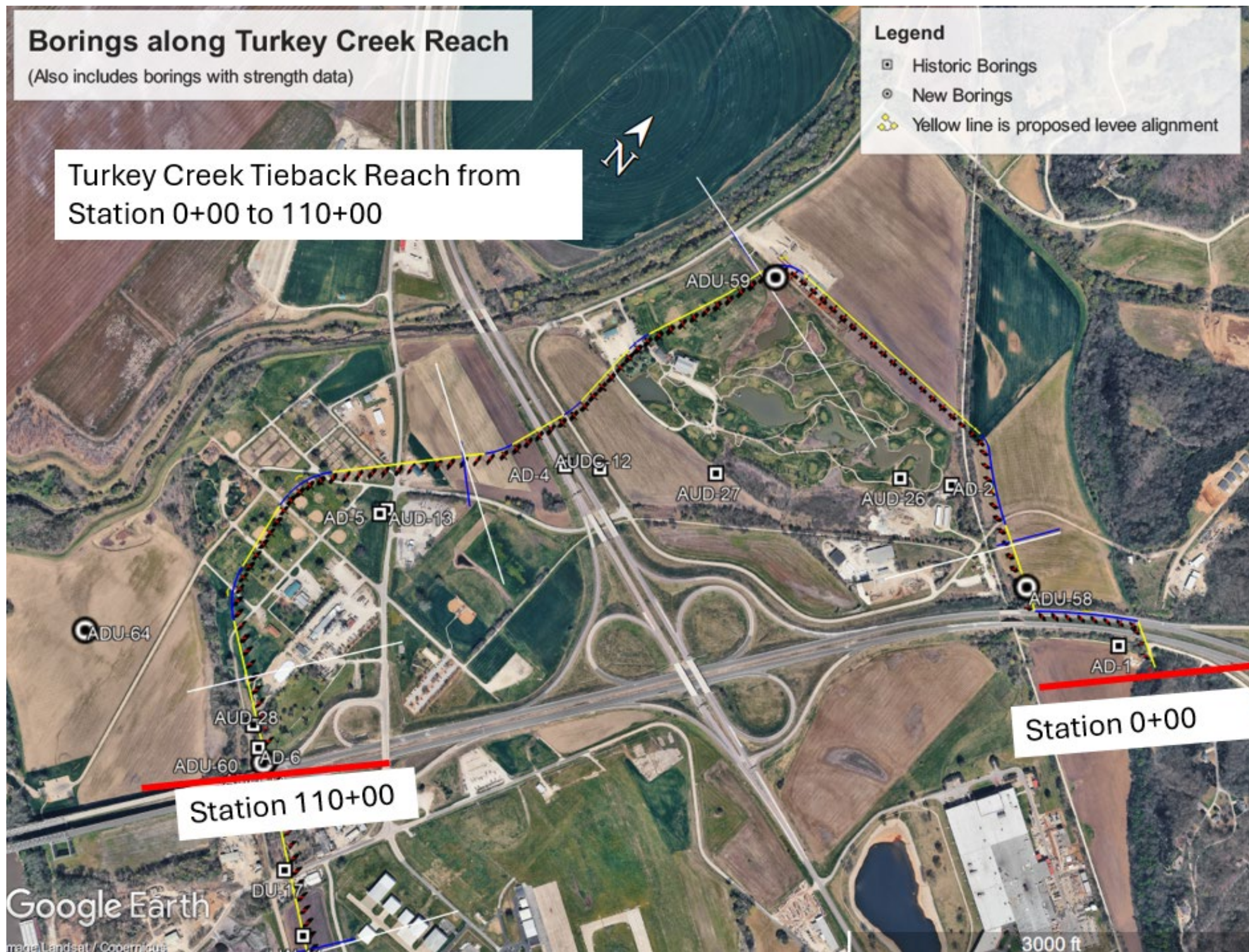
Borings along Turkey Creek Reach

(Also includes borings with strength data)

Turkey Creek Tieback Reach from
Station 0+00 to 110+00

Legend

- Historic Borings
- New Borings
- Yellow line is proposed levee alignment



Borings along Mainstem Reach

(Also includes borings with strength data)

Legend

- Historic Borings
- New Borings
- Yellow line is proposed levee alignment

Mainstem Reach from Station
112+00 to 278+00

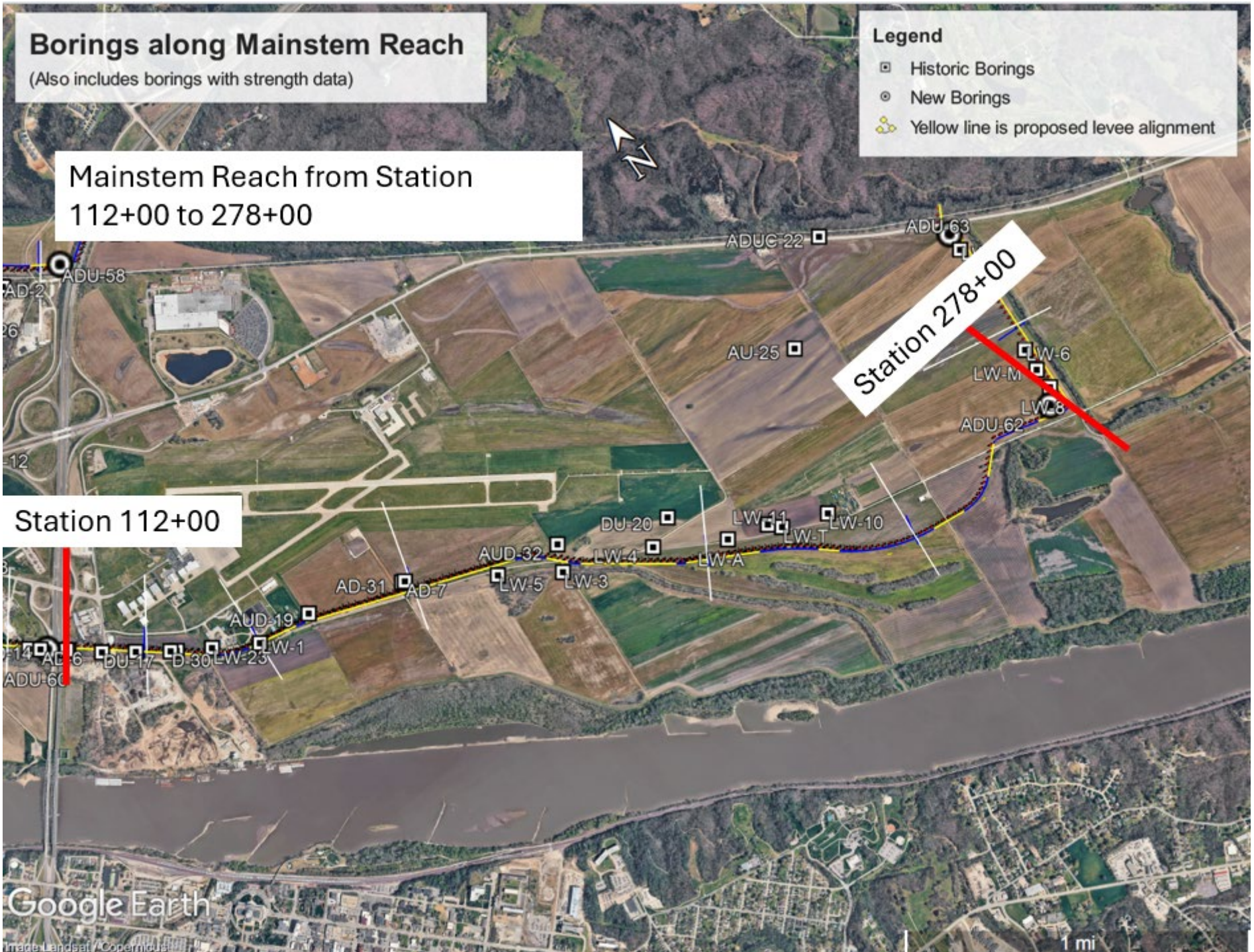
Station 112+00

Station 278+00

Google Earth

Image Landsat / Copernicus

1 mi



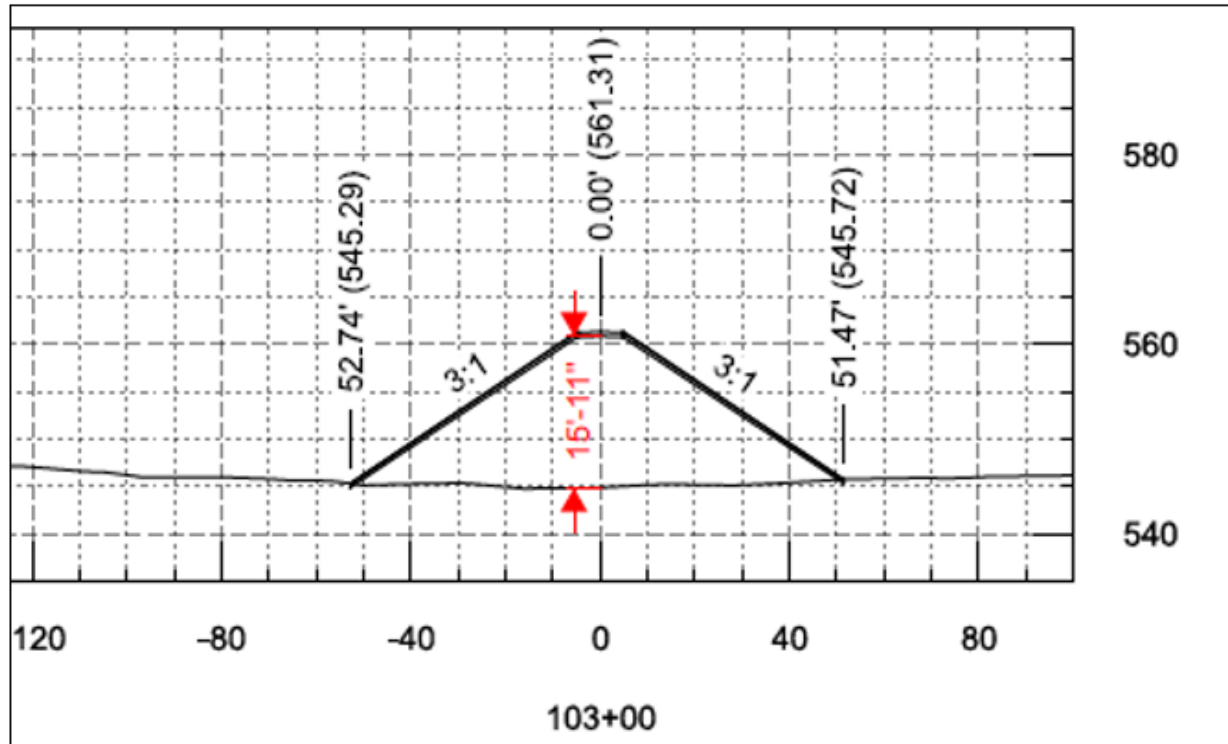
Borings along Drainage Ditch Tieback Reach

(Also includes borings with strength data)

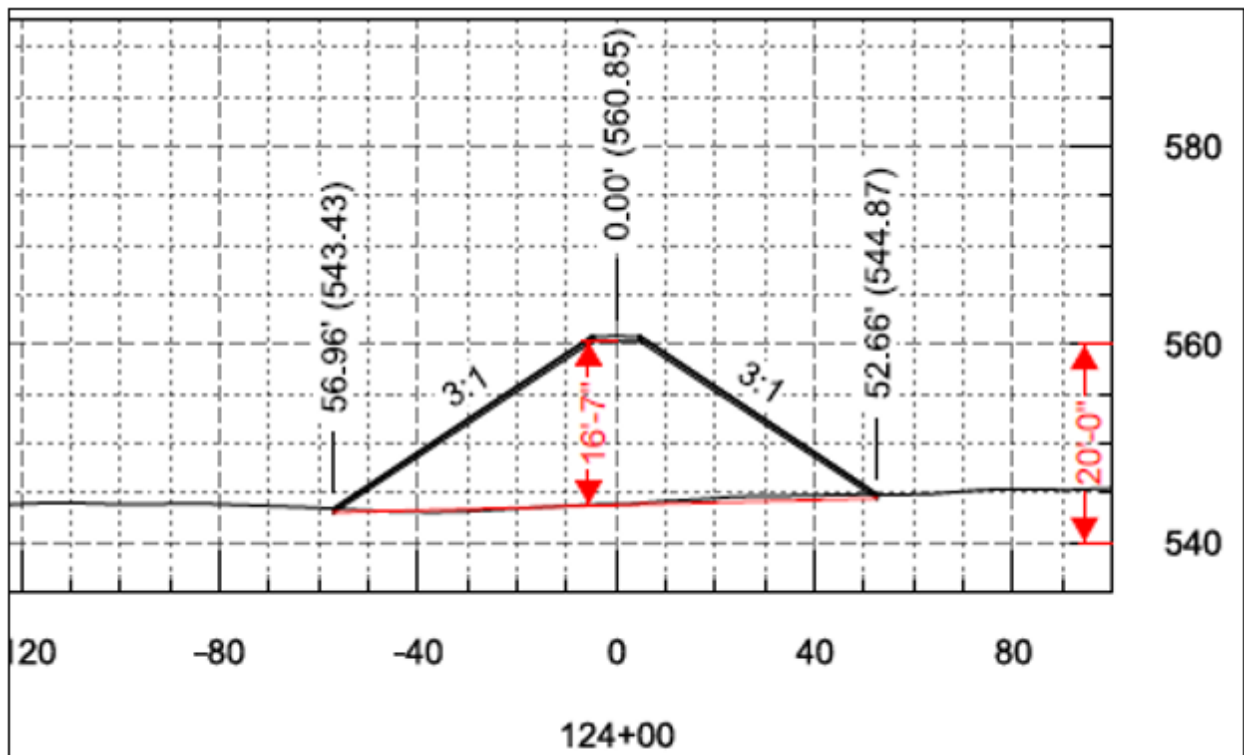
Legend

- Historic Borings
- New Borings
- Yellow line is proposed levee alignment

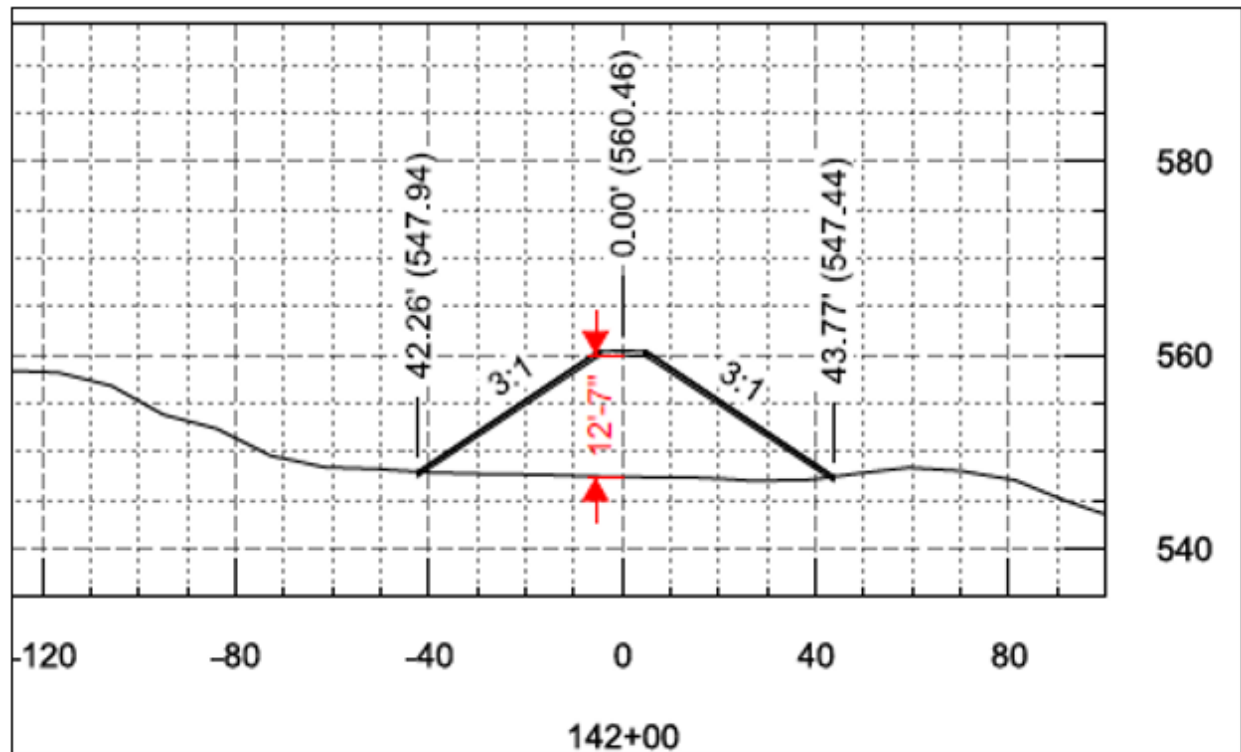




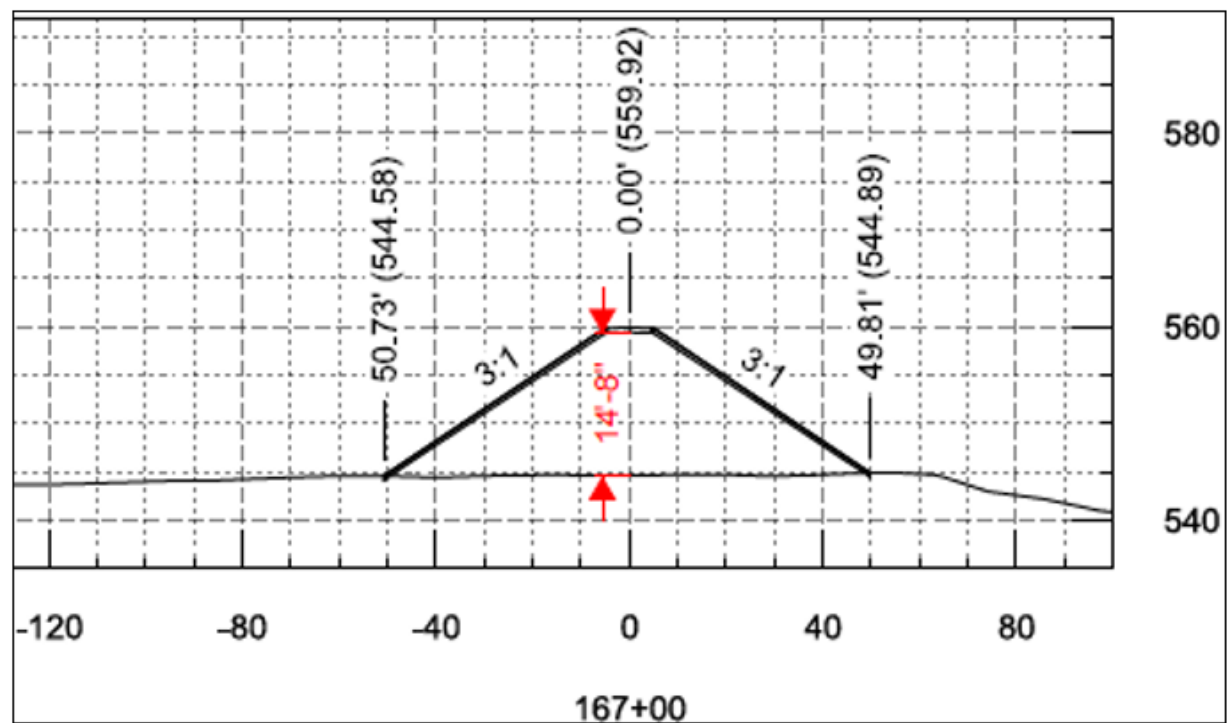
Represents Stat. 0+00 to 112+00 for underseepage



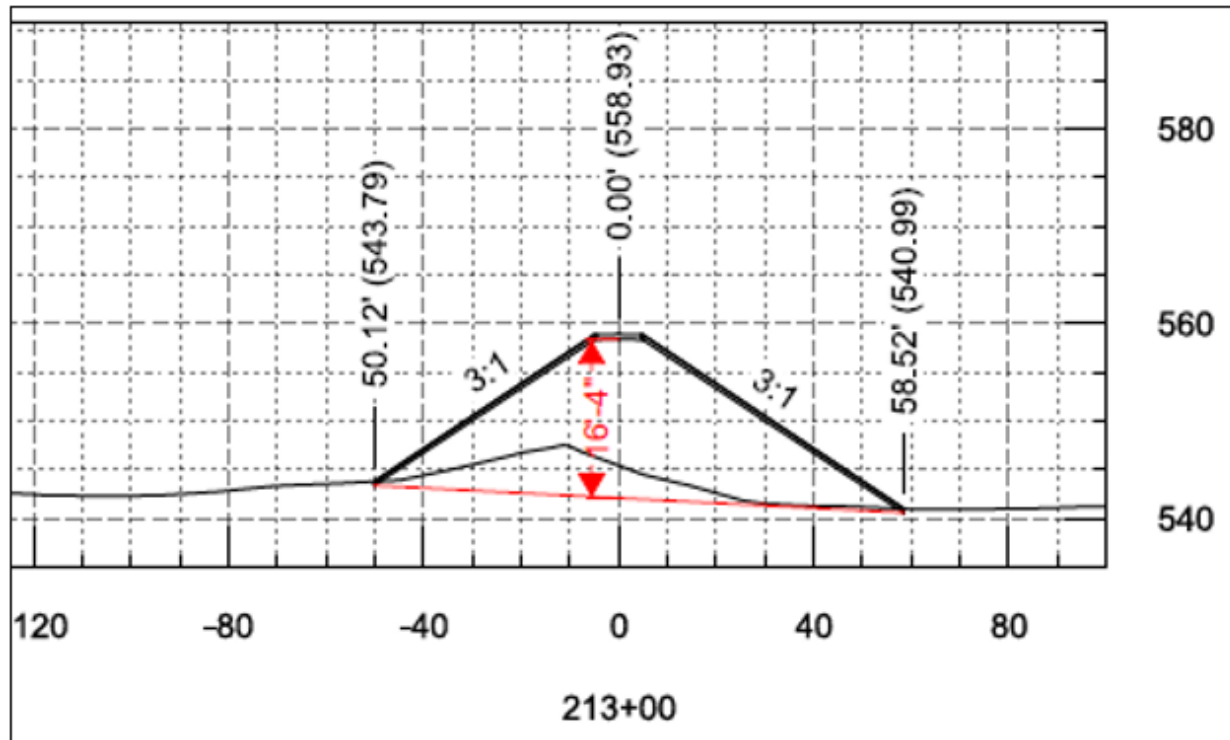
Represents Stat. 112+00 to 135+00 for underseepage



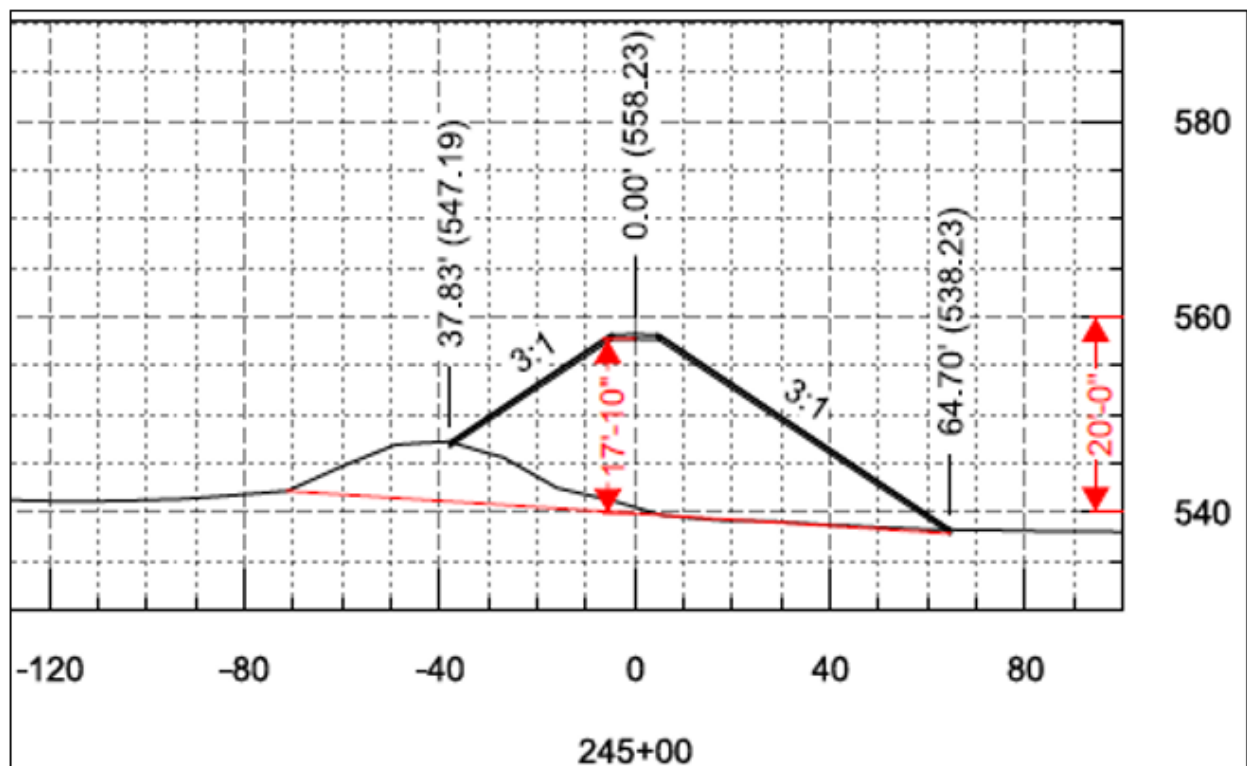
Represents Stat. 135+00 to 146+00 for underseepage



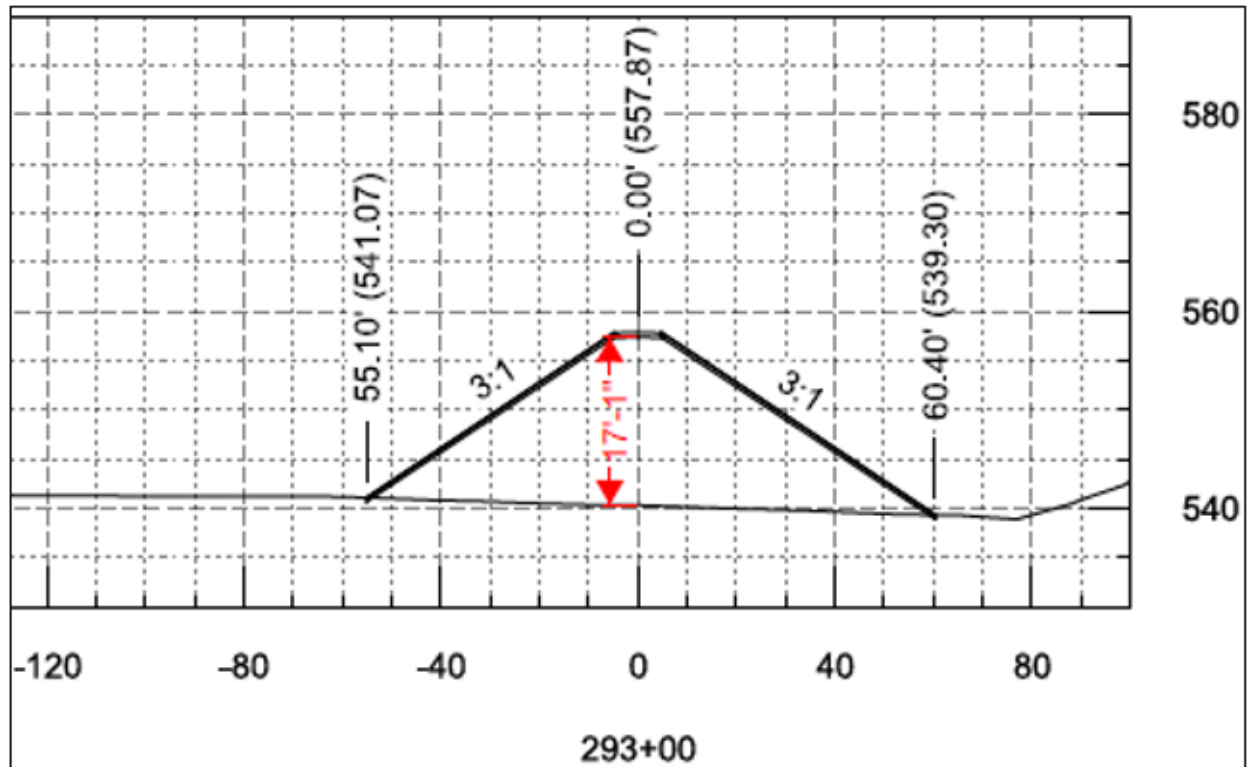
Represents Stat. 146+00 to 183+00 for underseepage



Represents Stat. 183+00 to 225+00 for underseepage



Represents Stat. 225+00 to 278+00 for underseepage



Represents Stat. 278+00 to 316+00 for underseepage

Levee Unit Name			CA13 FEDERAL INTEREST PLAN												Blanket Thickness estimated based on representative borings along each reach.										Some Layne Borings reached top of rock. TOR was reached between 449.8 and 455. Average TOR was 452.5. Assumed Average TOR for feasibility									
UNDERSEPAGE ANALYSIS WITHOUT WELLS			Case used for stability						L2= crest width + 2 (Hx3)																									
Case Analyzed - Water at Levee Top																																		
Blanket Unit Weight =			120.0 pcf (saturated)																															
Station	Civil Design Cross Section Station	Blanket Thickness	Top of Levee	River Side Ground	Land Side Ground	Land Side Tailwater	River Blanket Bottom	Land Blanket Bottom	Top of Bedrock	Ditching	Permeability Ratio		Imperious Blanket Thickness (ft)			Pervious Blanket	Seepage Length (ft)			Effective Seepage Length (ft)		Head at	Head at	Computed Hydraulic	Critical Hydraulic	Factor of Safety for	average horizontal gradient between entrance and levee toe	Remarks						
			Elevation	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation	Head (ft)	River Side	Land Side	River Side	Levee	Land Side	Thickness (ft)	River Side	Land Side	Factor	River Side	Land Side	Toe (ft)	Toe (elevation msl)	Gradient	Gradient	Effective Stress Uplift / Blanket Rupture	(ft)							
			(msl)	(msl)	(msl)	(msl)	(msl)	(msl)	(msl)	H	k _r /k _u	k _r /k _u	Z _{rw}	Z _{we}	Z _u	d	L ₁	L ₂	C ₁	C ₂	X ₁	X ₂	h _u	h _d	h _c	h _c	(F _u /F _c)	(ft)						
Primary Underseepage for All Reaches																																		
CA13 0+00 to 110+00 (Turk Crk Tieback)(update to Section 103+00)	103+00	12'	581	546	545	545	534	533	452.5	18.0	500	500	12	12	12	81.5	1500	100	infinity	0.001430	0.001430	680.38	699.29	7.53	552.53	0.63	0.92	1.5	0.02	SEEPAGE BERM REQUIRED				
Highway Embankment high ground																																		
CA13 112+00 to 135+00 (Mainstem)(update to sect 124+00)	124+00	10'	581	545	543	543	535	533	452.5	18.0	500	500	10	10	10	82.5	2000	118	infinity	0.001557	0.001557	639.73	642.28	8.26	551.26	0.83	0.92	1.1	0.02	SEEPAGE BERM REQUIRED				
CA13 136+00 to 148+00 (update to section at station 142+00) (refer to separate spreadsheet for number of RMs estimated)	142+00	10'	580	548	548	548	538	538	452.5	12.0	500	500	10	10	10	85.5	1700		0.001529	0.001529	646.66	653.83	5.68	553.68	0.57	0.92	1.6	0.02						
CA13 146+00 to 183+00 (update to sect 187+00)	187+00	10'	580	545	545	545	535	535	452.5	15.0	500	500	10	10	10	82.5	2150	100	infinity	0.001557	0.001557	640.67	642.26	6.97	551.97	0.70	0.92	1.3	0.02	SEEPAGE BERM REQUIRED				
CA13 183+00 to 225+00 (update to Section 213+00)	213+00	10'	558	541	544	544	531	534	452.5	15.0	500	500	10	10	10	78.5	2505		0.001596	0.001596	626.06	626.50	6.95	550.95	0.69	0.92	1.3	0.02	SEEPAGE BERM REQUIRED					
CA13 225+00 to 278+00 (update to Sect 245+00)	245+00	10'	558	538	543	541	528	533	452.5	17.0	500	500	10	10	10	75.5	2400	112	infinity	0.001628	0.001628	613.91	614.41	7.78	550.78	0.78	0.92	1.2	0.02	SEEPAGE BERM REQUIRED				
CA13 278+00 to 315+00 (update to 293+00)(C/O tieback)(Nieman's Crk is source, drainage ditch is to shallow)(top levee below aggregate)	293+00	14'	558	538.2	542.5	542.5	524.2	528.5	452.5	15.1	500	500	14	14	14	71.7	2700		0.001412	0.001412	707.76	708.45	7.05	549.55	0.50	0.92	1.8	0.02						

Levee Unit Name		CA13 FEDERAL INTEREST PLAN										Blanket Thickness estimated based on representative borings along each reach.										Some Layne Borings reached top of rock. TOR was reached between 449.8 and 455. Average TOR was 452.5. Assumed Average TOR for feasibility																										
UNDERSEEPAGE ANALYSIS WITHOUT WELLS		Case used for stability										L2= crest width + 2 (Hx3)																																				
Case Analyzed - Water at Levee Top																																																
Blanket Unit Weight =		120.0 pcf (saturated)																																														
Station	Civil Design Cross Section Station	Soils and Foundations										Blanket Thickness (msl)	Blanket Slope	Land Side Ground	Land Side Tailwater	River Blanket Bottom	Land Blanket Bottom	Top of Bedrock	Ditching	Permeability Ratio		Imperious Blanket Thickness (ft)					Pervious Blanket	Seepage Length (ft)			Effective Seepage Length (ft)		Head at Toe (ft)	Head at Toe (elevation msl)	Computed Hydraulic Gradient	Critical Hydraulic Gradient	Factor of Safety for	average horizontal gradient between entrance and levee toe	Remarks	BERM DESIGN per NWW Method								
		Elevation	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation	Head (ft)	River Side	Land Side									River Side	Levee	Land Side	Thickness (ft)	River Side	Land Side	Factor		River Side	Land Side	Toe (ft)	Toe (ft)	Gradient								Gradient	Effective Stress Uplift / Blanket Rupture	Factor of Safety at Berm Toe	Factor of Safety at Levee Toe	average horizontal gradient between entrance and berm toe				
		(msl)	(msl)	(msl)	(msl)	(msl)	(msl)	(msl)	H	k _r /k _u	k _r /k _u									Z _{rw}	Z _{we}	Z _{ld}	d	L ₁	L ₂	C ₁		C ₂	X ₁	X ₂	h _u	h _d								h _c	h _c	(F _u /F _c)	(h _u)					
Primary Underseepage for All Reaches																																																
CA13 0+00 to 110+00 (Turk Crk Tieback (update to Section 103+00))		103+00	12'	581	548	545	545	534	533	452.8	18.0	500	500	12	12	12	81.5	1500	100	infinity	0.001430	0.001430	680.38	699.29	7.53	552.53	0.63	0.92	1.5	0.02	SEEPAGE BERM REQUIRED	150	3	7.17	6.44	7.94	1.72	2.80	0.02									
Highway Embankment high ground (103+00)																																																
CA13 112+00 to 135+00 (Mainstem) (update to sect 124+00)		124+00	10'	581	545	543	543	535	533	452.8	18.0	500	500	10	10	10	82.5	2000	118	infinity	0.001557	0.001557	639.73	642.26	8.26	551.26	0.83	0.92	1.1	0.02	SEEPAGE BERM REQUIRED	150	3	7.84	6.97	8.75	1.32	2.09	0.02									
CA13 136+00 to 148+00 (updated to section at station 142+00) (refer to separate spreadsheet for number of RMs estimated)		142+00	10'	580	548	548	548	538	538	452.8	12.0	500	500	10	10	10	85.5	1700		0.001529	0.001529	646.66	653.83	5.68	553.88	0.57	0.92	1.6	0.02																			
CA13 146+00 to 183+00 (update to sect 187+00)		187+00	10'	580	545	545	545	535	535	452.8	15.0	500	500	10	10	10	82.5	2150	100	infinity	0.001557	0.001557	640.67	642.26	6.97	551.97	0.70	0.92	1.3	0.02	SEEPAGE BERM REQUIRED	150	3	6.81	5.88	7.38	1.87	2.74	0.02									
CA13 183+00 to 225+00 (update to Section 213+00)		213+00	10'	558	541	544	544	531	534	452.8	15.0	500	500	10	10	10	78.5	2505		0.001596	0.001596	626.06	626.50	6.95	550.95	0.69	0.92	1.3	0.02	SEEPAGE BERM REQUIRED	150	3	6.58	5.84	7.37	1.88	2.75	0.02										
CA13 225+00 to 278+00 (update to Sect 265+00)		265+00	10'	558	538	543	541	528	533	452.5	17.0	500	500	10	10	10	75.5	2400	112	infinity	0.001628	0.001628	613.91	614.41	7.78	550.78	0.78	0.92	1.2	0.02	SEEPAGE BERM REQUIRED	150	3	7.38	6.53	8.28	1.41	2.27	0.02									
CA13 278+00 to 315+00 (update to 259+00) (C/O tieback) (Nieman's Crk is source, drainage ditch is to shallow) (top levee below aggregate)		293+00	14'	558	538.2	542.5	542.5	524.2	528.5	452.5	15.1	500	500	14	14	14	71.7	2700		0.001412	0.001412	707.76	708.45	7.06	549.55	0.50	0.92	1.8	0.02																			

[illegible][illegible]

Comparison of CA13 Berm Coverage to Benchmark Data

Table 1: Benchmark Data (MoRiv levees without relief wells or floodwall sections)

Levee Unit	Length of levee in Unit (ft)	Underseepage (ft)	% Underseep Berm for levee Unit in Question	Stability (ft)	% Stability Berm for levee Unit in Question
L246	175926	24625	14	47500	27
R351	68300	0	0	31475	46
Birmingham	54000	7000	13	26629	49
L408	103300	0	0	27929	27
R440	56300	0	0	38130	68
L448-443	44321	0	0	28600	65
L476	53400	0	0	32200	60
R482	43300	26600	61	35200	81
L488	60666	26041	43	26041	43
R500	21885	19185	88	19185	88
New Haven	2100	0	0	660	31
Chariton (mainstem project)	56239	10264	18	25750	46
Totals	739737	113715		313549	

Berm Type	Average Percentage
Average % Underseepage Berm	15%
Average % Stability Berm	42%

% CAB
58%
43%

Possible reason that Benchmark levees had a average underseepage berm average lower than CAB

FS underseepage requirement on benchmark levees = 1.1
 " " " CAB = 1.6 required RMW

Table 2. CA13 Stability Berm Coverage

Station	Length of levee (ft)	Labeled Stability Berm (ft)	labeled underseepage but required to Achieve Stability FS	Total berm Length required to achieve Required Stability FS (ft)
0+00 to 12+31	1,230	0	0	0
12+31 to 18+31	600	0	600	600
18+31 to 75+20	5,689	5,689	0	5,689
75+20 to 78+83	363	0	363	363
78+83 to 100+68	2,185	2,185	0	2,185
100+68 to 110+00	932	0	932	932
110 to 112+00	200	0	0	0
112+00 to 278+00	16,600	0	0	0
278+00 to 315+00	3,700	3,700	0	3,700
315+00 to 316+52	152	0	0	0
Totals	31,651	11,574	1,895	13,469

Average CA 13 Stability
Berm Coverage=

43%

Table 3: CA13 Underseepage Berm Coverage

Station	Length of levee (ft)	Length of Underseepage Berm (ft)
0+00 to 12+31	1,230	0
12+31 to 18+31	600	600
18+31 to 75+20	5,689	0
75+20 to 78+83	363	363
78+83 to 100+68	2,185	0
100+68 to 110+00	932	932
110 to 112+00	200	0
112+00 to 278+00	16,600	16,600
278+00 to 315+00	3,700	0
315+00 to 316+52	152	0
Totals	31,651	18,495

**Average CA 13
Underseepage Berm
Coverage =**

58%

Plans Not Selected

Capital View, No Setback from existing, CA1

Levee Unit Name
UNDERSEEPAGE ANALYSIS WITHOUT WELLS
Case Analyzed - Water at Levee Top

ROWS IN THIS TAB CAN BE COPIED DOWN AS MANY TIMES AS DESIRED. HOWEVER, THE WELL ANALYSIS TAB AND ASSOCIATED PLOTS ONLY REFERENCE THE TOP ROW OF DATA

Blanket Unit Weight = 115.0 pcf (saturated)

	Top of Levee	River Side Ground	Land Side Ground	Land Side Tailwater	River Blanket Bottom	Land Blanket Bottom	Top of Bedrock	Drivinq	Permeability Ratio	Impervious Blanket Thickness (ft)	Pervious Blanket	Seepage Length (ft)				Effective Seepage Length (ft)		Head at	Head at	Computed Hydraulic	Critical Hydraulic	Factor of Safety for		BERM DESIGN per NWK Method										EM 1110-2-1913 Barm Design						Design Berm																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation	Head (ft)	R River Side	Land Side	R River Side	Levee	Land Side	Thickness (ft)	R River Side			Levee	Land Side	Factor	R River Side	Land Side	Toe (ft)	Toe (elevation ft)	Gradient	Gradient	Effective Stress Lipilt / Blanket Rugosity	average horizontal gradient between entrance and levee toe	FS allowable at berm toe	FS allowable at levee toe	Xop - Berm Width (ft)	1-berm thickness (ft)	Xs - Berm Width (ft)	1-berm thickness (ft)	Type (Perv, Sern)	Width (ft)	Thickness at levee toe (ft)	Thickness at Berm Crown (ft)	Berm/Leve Tie-in Elevation	Berm Crown Elevation																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
Station	(mat)	(mat)	(mat)	(mat)	(mat)	(mat)	(mat)	H	k _v /k _s	k _v /k _s	Z _{av}	Z _{ap}	Z _{av}	d	L ₁	L ₂	L ₃	G ₁	G ₂	n ₁	n ₂	n _u	m ₁	m ₂	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	L ₉	L ₁₀	L ₁₁	L ₁₂	L ₁₃	L ₁₄	L ₁₅	L ₁₆	L ₁₇	L ₁₈	L ₁₉	L ₂₀	L ₂₁	L ₂₂	L ₂₃	L ₂₄	L ₂₅	L ₂₆	L ₂₇	L ₂₈	L ₂₉	L ₃₀	L ₃₁	L ₃₂	L ₃₃	L ₃₄	L ₃₅	L ₃₆	L ₃₇	L ₃₈	L ₃₉	L ₄₀	L ₄₁	L ₄₂	L ₄₃	L ₄₄	L ₄₅	L ₄₆	L ₄₇	L ₄₈	L ₄₉	L ₅₀	L ₅₁	L ₅₂	L ₅₃	L ₅₄	L ₅₅	L ₅₆	L ₅₇	L ₅₈	L ₅₉	L ₆₀	L ₆₁	L ₆₂	L ₆₃	L ₆₄	L ₆₅	L ₆₆	L ₆₇	L ₆₈	L ₆₉	L ₇₀	L ₇₁	L ₇₂	L ₇₃	L ₇₄	L ₇₅	L ₇₆	L ₇₇	L ₇₈	L ₇₉	L ₈₀	L ₈₁	L ₈₂	L ₈₃	L ₈₄	L ₈₅	L ₈₆	L ₈₇	L ₈₈	L ₈₉	L ₉₀	L ₉₁	L ₉₂	L ₉₃	L ₉₄	L ₉₅	L ₉₆	L ₉₇	L ₉₈	L ₉₉	L ₁₀₀	L ₁₀₁	L ₁₀₂	L ₁₀₃	L ₁₀₄	L ₁₀₅	L ₁₀₆	L ₁₀₇	L ₁₀₈	L ₁₀₉	L ₁₁₀	L ₁₁₁	L ₁₁₂	L ₁₁₃	L ₁₁₄	L ₁₁₅	L ₁₁₆	L ₁₁₇	L ₁₁₈	L ₁₁₉	L ₁₂₀	L ₁₂₁	L ₁₂₂	L ₁₂₃	L ₁₂₄	L ₁₂₅	L ₁₂₆	L ₁₂₇	L ₁₂₈	L ₁₂₉	L ₁₃₀	L ₁₃₁	L ₁₃₂	L ₁₃₃	L ₁₃₄	L ₁₃₅	L ₁₃₆	L ₁₃₇	L ₁₃₈	L ₁₃₉	L ₁₄₀	L ₁₄₁	L ₁₄₂	L ₁₄₃	L ₁₄₄	L ₁₄₅	L ₁₄₆	L ₁₄₇	L ₁₄₈	L ₁₄₉	L ₁₅₀	L ₁₅₁	L ₁₅₂	L ₁₅₃	L ₁₅₄	L ₁₅₅	L ₁₅₆	L ₁₅₇	L ₁₅₈	L ₁₅₉	L ₁₆₀	L ₁₆₁	L ₁₆₂	L ₁₆₃	L ₁₆₄	L ₁₆₅	L ₁₆₆	L ₁₆₇	L ₁₆₈	L ₁₆₉	L ₁₇₀	L ₁₇₁	L ₁₇₂	L ₁₇₃	L ₁₇₄	L ₁₇₅	L ₁₇₆	L ₁₇₇	L ₁₇₈	L ₁₇₉	L ₁₈₀	L ₁₈₁	L ₁₈₂	L ₁₈₃	L ₁₈₄	L ₁₈₅	L ₁₈₆	L ₁₈₇	L ₁₈₈	L ₁₈₉	L ₁₉₀	L ₁₉₁	L ₁₉₂	L ₁₉₃	L ₁₉₄	L ₁₉₅	L ₁₉₆	L ₁₉₇	L ₁₉₈	L ₁₉₉	L ₂₀₀	L ₂₀₁	L ₂₀₂	L ₂₀₃	L ₂₀₄	L ₂₀₅	L ₂₀₆	L ₂₀₇	L ₂₀₈	L ₂₀₉	L ₂₁₀	L ₂₁₁	L ₂₁₂	L ₂₁₃	L ₂₁₄	L ₂₁₅	L ₂₁₆	L ₂₁₇	L ₂₁₈	L ₂₁₉	L ₂₂₀	L ₂₂₁	L ₂₂₂	L ₂₂₃	L ₂₂₄	L ₂₂₅	L ₂₂₆	L ₂₂₇	L ₂₂₈	L ₂₂₉	L ₂₃₀	L ₂₃₁	L ₂₃₂	L ₂₃₃	L ₂₃₄	L ₂₃₅	L ₂₃₆	L ₂₃₇	L ₂₃₈	L ₂₃₉	L ₂₄₀	L ₂₄₁	L ₂₄₂	L ₂₄₃	L ₂₄₄	L ₂₄₅	L ₂₄₆	L ₂₄₇	L ₂₄₈	L ₂₄₉	L ₂₅₀	L ₂₅₁	L ₂₅₂	L ₂₅₃	L ₂₅₄	L ₂₅₅	L ₂₅₆	L ₂₅₇	L ₂₅₈	L ₂₅₉	L ₂₆₀	L ₂₆₁	L ₂₆₂	L ₂₆₃	L ₂₆₄	L ₂₆₅	L ₂₆₆	L ₂₆₇	L ₂₆₈	L ₂₆₉	L ₂₇₀	L ₂₇₁	L ₂₇₂	L ₂₇₃	L ₂₇₄	L ₂₇₅	L ₂₇₆	L ₂₇₇	L ₂₇₈	L ₂₇₉	L ₂₈₀	L ₂₈₁	L ₂₈₂	L ₂₈₃	L ₂₈₄	L ₂₈₅	L ₂₈₆	L ₂₈₇	L ₂₈₈	L ₂₈₉	L ₂₉₀	L ₂₉₁	L ₂₉₂	L ₂₉₃	L ₂₉₄	L ₂₉₅	L ₂₉₆	L ₂₉₇	L ₂₉₈	L ₂₉₉	L ₃₀₀	L ₃₀₁	L ₃₀₂	L ₃₀₃	L ₃₀₄	L ₃₀₅	L ₃₀₆	L ₃₀₇	L ₃₀₈	L ₃₀₉	L ₃₁₀	L ₃₁₁	L ₃₁₂	L ₃₁₃	L ₃₁₄	L ₃₁₅	L ₃₁₆	L ₃₁₇	L ₃₁₈	L ₃₁₉	L ₃₂₀	L ₃₂₁	L ₃₂₂	L ₃₂₃	L ₃₂₄	L ₃₂₅	L ₃₂₆	L ₃₂₇	L ₃₂₈	L ₃₂₉	L ₃₃₀	L ₃₃₁	L ₃₃₂	L ₃₃₃	L ₃₃₄	L ₃₃₅	L ₃₃₆	L ₃₃₇	L ₃₃₈	L ₃₃₉	L ₃₄₀	L ₃₄₁	L ₃₄₂	L ₃₄₃	L ₃₄₄	L ₃₄₅	L ₃₄₆	L ₃₄₇	L ₃₄₈	L ₃₄₉	L ₃₅₀	L ₃₅₁	L ₃₅₂	L ₃₅₃	L ₃₅₄	L ₃₅₅	L ₃₅₆	L ₃₅₇	L ₃₅₈	L ₃₅₉	L ₃₆₀	L ₃₆₁	L ₃₆₂	L ₃₆₃	L ₃₆₄	L ₃₆₅	L ₃₆₆	L ₃₆₇	L ₃₆₈	L ₃₆₉	L ₃₇₀	L ₃₇₁	L ₃₇₂	L ₃₇₃	L ₃₇₄	L ₃₇₅	L ₃₇₆	L ₃₇₇	L ₃₇₈	L ₃₇₉	L ₃₈₀	L ₃₈₁	L ₃₈₂	L ₃₈₃	L ₃₈₄	L ₃₈₅	L ₃₈₆	L ₃₈₇	L ₃₈₈	L ₃₈₉	L ₃₉₀	L ₃₉₁	L ₃₉₂	L ₃₉₃	L ₃₉₄	L ₃₉₅	L ₃₉₆	L ₃₉₇	L ₃₉₈	L ₃₉₉	L ₄₀₀	L ₄₀₁	L ₄₀₂	L ₄₀₃	L ₄₀₄	L ₄₀₅	L ₄₀₆	L ₄₀₇	L ₄₀₈	L ₄₀₉	L ₄₁₀	L ₄₁₁	L ₄₁₂	L ₄₁₃	L ₄₁₄	L ₄₁₅	L ₄₁₆	L ₄₁₇	L ₄₁₈	L ₄₁₉	L ₄₂₀	L ₄₂₁	L ₄₂₂	L ₄₂₃	L ₄₂₄	L ₄₂₅	L ₄₂₆	L ₄₂₇	L ₄₂₈	L ₄₂₉	L ₄₃₀	L ₄₃₁	L ₄₃₂	L ₄₃₃	L ₄₃₄	L ₄₃₅	L ₄₃₆	L ₄₃₇	L ₄₃₈	L ₄₃₉	L ₄₄₀	L ₄₄₁	L ₄₄₂	L ₄₄₃	L ₄₄₄	L ₄₄₅	L ₄₄₆	L ₄₄₇	L ₄₄₈	L ₄₄₉	L ₄₅₀	L ₄₅₁	L ₄₅₂	L ₄₅₃	L ₄₅₄	L ₄₅₅	L ₄₅₆	L ₄₅₇	L ₄₅₈	L ₄₅₉	L ₄₆₀	L ₄₆₁	L ₄₆₂	L ₄₆₃	L ₄₆₄	L ₄₆₅	L ₄₆₆	L ₄₆₇	L ₄₆₈	L ₄₆₉	L ₄₇₀	L ₄₇₁	L ₄₇₂	L ₄₇₃	L ₄₇₄	L ₄₇₅	L ₄₇₆	L ₄₇₇	L ₄₇₈	L ₄₇₉	L ₄₈₀	L ₄₈₁	L ₄₈₂	L ₄₈₃	L ₄₈₄	L ₄₈₅	L ₄₈₆	L ₄₈₇	L ₄₈₈	L ₄₈₉	L ₄₉₀	L ₄₉₁	L ₄₉₂	L ₄₉₃	L ₄₉₄	L ₄₉₅	L ₄₉₆	L ₄₉₇	L ₄₉₈	L ₄₉₉	L ₅₀₀	L ₅₀₁	L ₅₀₂	L ₅₀₃	L ₅₀₄	L ₅₀₅	L ₅₀₆	L ₅₀₇	L ₅₀₈	L ₅₀₉	L ₅₁₀	L ₅₁₁	L ₅₁₂	L ₅₁₃	L ₅₁₄	L ₅₁₅	L ₅₁₆	L ₅₁₇	L ₅₁₈	L ₅₁₉	L ₅₂₀	L ₅₂₁	L ₅₂₂	L ₅₂₃	L ₅₂₄	L ₅₂₅	L ₅₂₆	L ₅₂₇	L ₅₂₈	L ₅₂₉	L ₅₃₀	L ₅₃₁	L ₅₃₂	L ₅₃₃	L ₅₃₄	L ₅₃₅	L ₅₃₆	L ₅₃₇	L ₅₃₈	L ₅₃₉	L ₅₄₀	L ₅₄₁	L ₅₄₂	L ₅₄₃	L ₅₄₄	L ₅₄₅	L ₅₄₆	L ₅₄₇	L ₅₄₈	L ₅₄₉	L ₅₅₀	L ₅₅₁	L ₅₅₂	L ₅₅₃	L ₅₅₄	L ₅₅₅	L ₅₅₆	L ₅₅₇	L ₅₅₈	L ₅₅₉	L ₅₆₀	L ₅₆₁	L ₅₆₂	L ₅₆₃	L ₅₆₄	L ₅₆₅	L ₅₆₆	L ₅₆₇	L ₅₆₈	L ₅₆₉	L ₅₇₀	L ₅₇₁	L ₅₇₂	L ₅₇₃	L ₅₇₄	L ₅₇₅	L ₅₇₆	L ₅₇₇	L ₅₇₈	L ₅₇₉	L ₅₈₀	L ₅₈₁	L ₅₈₂	L ₅₈₃	L ₅₈₄	L ₅₈₅	L ₅₈₆	L ₅₈₇	L ₅₈₈	L ₅₈₉	L ₅₉₀	L ₅₉₁	L ₅₉₂	L ₅₉₃	L ₅₉₄	L ₅₉₅	L ₅₉₆	L ₅₉₇	L ₅₉₈	L ₅₉₉	L ₆₀₀	L ₆₀₁	L ₆₀₂	L ₆₀₃	L ₆₀₄	L ₆₀₅	L ₆₀₆	L ₆₀₇	L ₆₀₈	L ₆₀₉	L ₆₁₀	L ₆₁₁	L ₆₁₂	L ₆₁₃	L ₆₁₄	L ₆₁₅	L ₆₁₆	L ₆₁₇	L ₆₁₈	L ₆₁₉	L ₆₂₀	L ₆₂₁	L ₆₂₂	L ₆₂₃	L ₆₂₄	L ₆₂₅	L ₆₂₆	L ₆₂₇	L ₆₂₈	L ₆₂₉	L ₆₃₀	L ₆₃₁	L ₆₃₂	L ₆₃₃	L ₆₃₄	L ₆₃₅	L ₆₃₆	L ₆₃₇	L ₆₃₈	L ₆₃₉	L ₆₄₀	L ₆₄₁	L ₆₄₂	L ₆₄₃	L ₆₄₄	L ₆₄₅	L ₆₄₆	L ₆₄₇	L ₆₄₈	L ₆₄₉	L ₆₅₀	L ₆₅₁	L ₆₅₂	L ₆₅₃	L ₆₅₄	L ₆₅₅	L ₆₅₆	L ₆₅₇	L ₆₅₈	L ₆₅₉	L ₆₆₀	L ₆₆₁	L ₆₆₂	L ₆₆₃	L ₆₆₄	L ₆₆₅	L ₆₆₆	L ₆₆₇	L ₆₆₈	L ₆₆₉	L ₆₇₀	L ₆₇₁	L ₆₇₂	L ₆₇₃	L ₆₇₄	L ₆₇₅	L ₆₇₆	L ₆₇₇	L ₆₇₈	L ₆₇₉	L ₆₈₀	L ₆₈₁	L ₆₈₂	L ₆₈₃	L ₆₈₄	L ₆₈₅	L ₆₈₆	L ₆₈₇	L ₆₈₈	L ₆₈₉	L ₆₉₀	L ₆₉₁	L ₆₉₂	L ₆₉₃	L ₆₉₄	L ₆₉₅	L ₆₉₆	L ₆₉₇	L ₆₉₈	L ₆₉₉	L ₇₀₀	L ₇₀₁	L ₇₀₂	L ₇₀₃	L ₇₀₄	L ₇₀₅	L ₇₀₆	L ₇₀₇	L ₇₀₈	L ₇₀₉	L ₇₁₀	L ₇₁₁	L ₇₁₂	L ₇₁₃	L ₇₁₄	L ₇₁₅	L ₇₁₆	L ₇₁₇	L ₇₁₈	L ₇₁₉	L ₇₂₀	L ₇₂₁	L ₇₂₂	L ₇₂₃	L ₇₂₄	L ₇₂₅	L ₇₂₆	L ₇₂₇	L ₇₂₈	L ₇₂₉	L ₇₃₀	L ₇₃₁	L ₇₃₂	L ₇₃₃	L ₇₃₄	L ₇₃₅	L ₇₃₆	L ₇₃₇	L ₇₃₈	L ₇₃₉	L ₇₄₀	L ₇₄₁	L ₇₄₂	L ₇₄₃	L ₇₄₄	L ₇₄₅	L ₇₄₆	L ₇₄₇	L ₇₄₈	L ₇₄₉	L ₇₅₀	L ₇₅₁	L ₇₅₂	L ₇₅₃	L ₇₅₄	L ₇₅₅	L ₇₅₆	L ₇₅₇	L ₇₅₈	L ₇₅₉	L ₇₆₀	L ₇₆₁	L ₇₆₂	L ₇₆₃	L ₇₆₄	L ₇₆₅	L ₇₆₆	L ₇₆₇	L ₇₆₈	L ₇₆₉	L ₇₇₀	L ₇₇₁	L ₇₇₂	L ₇₇₃	L ₇₇₄	L ₇₇₅	L ₇₇₆	L ₇₇₇	L ₇₇₈	L ₇₇₉	L ₇₈₀	L ₇₈₁	L ₇₈₂	L ₇₈₃	L ₇₈₄	L ₇₈₅	L ₇₈₆	L ₇₈₇	L ₇₈₈	L ₇₈₉	L ₇₉₀	L ₇₉₁	L ₇₉₂	L ₇₉₃	L ₇₉₄	L ₇₉₅	L ₇₉₆	L ₇₉₇	L ₇₉₈	L ₇₉₉	L ₈₀₀	L ₈₀₁	L ₈₀₂	L ₈₀₃	L ₈₀₄	L ₈₀₅	L ₈₀₆	L ₈₀₇	L ₈₀₈	L ₈₀₉	L ₈₁₀	L ₈₁₁	L ₈₁₂	L ₈₁₃	L ₈₁₄	L ₈₁₅	L ₈₁₆	L ₈₁₇	L ₈₁₈	L ₈₁₉	L ₈₂₀	L ₈₂₁	L ₈₂₂	L ₈₂₃	L ₈₂₄	L ₈₂₅	L ₈₂₆	L ₈₂₇	L ₈₂₈	L ₈₂₉	L ₈₃₀	L ₈₃₁	L ₈₃₂	L ₈₃₃	L ₈₃₄	L ₈₃₅	L ₈₃₆	L ₈₃₇	L ₈₃₈	L ₈₃₉	L ₈₄₀	L ₈₄₁	L ₈₄₂	L ₈₄₃	L ₈₄₄	L ₈₄₅	L ₈₄₆	L ₈₄₇	L ₈₄₈	L ₈₄₉	L ₈₅₀	L ₈₅₁	L ₈₅₂	L ₈₅₃	L ₈₅₄	L ₈₅₅	L ₈₅₆	L ₈₅₇	L ₈₅₈	L ₈₅₉	L ₈₆₀	L ₈₆₁	L ₈₆₂	L ₈₆₃	L ₈₆₄	L ₈₆₅	L ₈₆₆	L ₈₆₇	L ₈₆₈	L ₈₆₉	L ₈₇₀	L ₈₇₁	L ₈₇₂	L ₈₇₃	L ₈₇₄	L ₈₇₅	L ₈₇₆	L ₈₇₇	L ₈₇₈	L ₈₇₉	L<

Capital View, CA2, 1000ft minimum setback

Levee Unit Name
UNDERSEEPAGE ANALYSIS WITHOUT WELLS
Case Analyzed - Water at Levee Top

ROWS IN THIS TAB CAN BE COPIED DOWN AS MANY TIMES AS DESIRED. HOWEVER, THE WELL ANALYSIS TAB AND ASSOCIATED PLOTS ONLY REFERENCE THE TOP ROW OF DATA.

Blanket Unit Weight =		150 pcf (saturated)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
	Top of Levee	River Side Ground	Land Side Ground	Land Side Tailwater	River Blanket Bottom	Land Blanket Bottom	Top of Bedrock	Driving	Permeability Ratio		Impervious Blanket Thickness (ft)		Pervious Blanket	Seepage Length (ft)			Effective Seepage Length (ft)		Head at Toe	Head at Toe (elevation msl)	Computed Hydraulic Gradient	Critical Hydraulic Gradient	Factor of Safety for Effective Stress Uplift / Blanket Rupture (L/L _c)	average horizontal gradient between entrance and berm toe (h ₁ /L)	Remarks	BERM DESIGN per NWK Method								EM 1110-2-1913 Berm Design				Design Berm																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation	Head (ft)	River Side	Land Side	River Side	Levee	Land Side	Thickness (ft)	River Side	Levee	Land Side	River Side	Land Side	Toe (ft)	Gradient	Gradient	Factor of Safety at Berm Toe	Factor of Safety at Levee Toe			Berm Width	Berm Thickness	Head at Berm Midpoint	Head at Berm Toe	Head at Levee Toe	Factor of Safety at Berm Toe	Factor of Safety at Levee Toe	average horizontal gradient between entrance and berm toe	FS allowable at levee toe	FS allowable at Berm toe	X _{ap} - Berm Width (ft)	1-berm thickness (ft)	X _b - Berm Width (ft)	1-berm thickness (ft)	Selected Berm for Design: Consider berm				Berm/Levee Tie-in Elevation	Berm Crown Elevation																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	(msl)	(msl)	(msl)	(msl)	(msl)	(msl)	(msl)	H	k/k _u	k/k _u	Z _{uv}	Z _{ue}	Z _{ue}	d	L ₁	L ₂	L ₃	c _v	c _h	x ₁	x ₂	h _u	h _e	L _c		L _c	(L/L _c)	(h ₁ /L)		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	1.6	1.0	-794	-1.6	-842	-1.5					550.0	550.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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Optimization, CA4 and CA5

Levee Unit Name
UNDERSEEPAGE ANALYSIS WITHOUT WELLS
Case Analyzed - Water at Levee Top

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Blanket Unit Weight =		115 pcf (saturated)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
Top of Levee	River Side Ground	Land Side Ground	Land Side Tailwater	River Blanket Bottom	Land Blanket Bottom	Top of Bedrock	Driving	Permeability Ratio		Impervious Blanket Thickness (ft)					Previous Blanket	Seepage Length (ft)				Effective Seepage Length (ft)		Head at	Head at	Computed Hydraulic	Critical Hydraulic	Factor of Safety for	average horizontal gradient between entrance and levee toe	Remarks	BERM DESIGN per NWK Method										EM 11102-1913 BERM Design						Design BERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
Elevation	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation	Head (ft)	River Side	Land Side	River Side	Levee	Land Side	Thickness (ft)	River Side	Levee	Land Side	Factor	River Side	Land Side	Toe (ft)	Toe (elevation toe)	Gradient	Gradient	Effective Stress Uplift / Blanket Rupture		Berm Width			Berm Thickness	Head at Berm Midpoint	Head at Berm Toe	Head at Levee Toe	Factor of Safety at Berm Toe	Factor of Safety at Levee Toe	FS allowable at levee toe	FS allowable at berm toe	Xap - Berm Width (ft)	1-berm thickness (ft)	Xa - Berm Width (ft)	1-berm thickness (ft)	Type (Perv, Semi)	Width (ft)	Thickness at levee toe (ft)	Thickness at Berm Crown (ft)	Berm/Levee Tie-in Elevation	Berm Elevation																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Station	(msl)	(msl)	(msl)	(msl)	(msl)	(msl)	H	k/k _u	k/k _u	z _u	z _u	z _u	d	L ₁	L ₂	L ₃	c ₁	c ₁	x ₁	x ₂	h _u	h _u	L _u	L _u	(L _u /L ₁)	(L _u)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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CA 8 and 9, Highway Alternative

Levee Unit Name
UNDERSEEPAGE ANALYSIS WITHOUT WELLS
Case Analyzed - Water at Levee Top

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Blanket Unit Weight =		115.0pcf (saturated)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
Top of Levee		River Side Ground		Land Side Ground		Land Side Tailwater		River Blanket Bottom		Land Blanket Bottom		Top of Bedrock		Driving		Permeability Ratio		Impervious Blanket Thickness (ft)					Pervious Blanket		Seepage Length (ft)			Effective Seepage Length (ft)			Head at Toe (ft)		Head at Berm Toe (elevation msl)		Computed Hydraulic		Critical Hydraulic		Factor of Safety for		average horizontal gradient between entrance and levee toe																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
Elevation	Elevation	Elevation	Elevation	Elevation	Elevation	Elevation	Head (ft)	River Side	Land Side	River Side	Levee	Land Side	Thickness (ft)	River Side	Levee	Land Side	Factor	L ₁	L ₂	L ₃	L ₄	L ₅	L ₆	L ₇	L ₈	L ₉	L ₁₀	L ₁₁	L ₁₂	L ₁₃	L ₁₄	L ₁₅	L ₁₆	L ₁₇	L ₁₈	L ₁₉	L ₂₀	L ₂₁	L ₂₂	L ₂₃	L ₂₄	L ₂₅	L ₂₆	L ₂₇	L ₂₈	L ₂₉	L ₃₀																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
Station	(msl)	(msl)	(msl)	(msl)	(msl)	(msl)	H	k/k ₀	k/k ₀	z ₀	z ₀	z ₀	d	L ₁	L ₂	L ₃	c ₁	c ₂	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x ₀	x